

ADDRESS ALLOCATION FOR MOBILE TERMINALS

Background of the Invention

5 The present invention pertains to communication systems and more particularly to a method for allocating a unique interface identifier to a mobile station.

10 When a mobile station connects to a General Packet Radio Support (GPRS) or Universal Mobile Telecommunications Service (UMTS) network, the mobile station uses a PDP (packet data protocol) context activation procedure in order to establish an internet protocol connectivity with an external Packet Data
15 Network (PDN). Present procedures for a mobile network (i.e. a GGSN, gateway GPRS support node) generate a unique mobile station interface identifier. This interface identifier is passed back to the mobile station during the PDP context activation.

20 However, this interface identifier does not allow the mobile station to generate an address with a network prefix other than the one from the GGSN. This mobile interface identifier may not be consistent with the other networks controlled by the mobile network.
25 Mobile stations require access to other packet data networks for various data functions provided by 2G, 2.5G and 3G, etc. External packet data networks typically employ strict control mechanisms over address assignment.

30 Current procedures which allow a mobile station to access an external packet data network for an Internet Protocol Version 6 (IPv6) address require the mobile station to support separate stateful address autoconfigurations. The drawbacks of the current
35 mobile station external PDN procedure are as follows. A mobile station must support an additional protocol

such as DHCP (dynamic host configuration protocol) which adds to the complexity and cost of the mobile station. Since additional signaling is required over the air, the time between the request and the time the communication "payload" is actually transferred is increased; this is referred to as the post-dialing delay. Lastly, since the mobile station spends more time on the air, the power of the mobile station is not conserved.

It is therefore highly desirable to have a stateful autoconfiguration procedure performed by a mobile network instead of a mobile station which allows stateless autoconfiguration without requiring the mobile station to support DHCP or any other stateful address configuration protocol required by the external network.

Brief Description of the Drawing

FIG. 1 is a block diagram of an IP address allocation for mobile terminals in accordance with the present invention.

FIG. 2 is a message flow diagram of a procedure for allocation of IP address for mobile terminals in accordance with the present invention

Detailed Description of the Preferred Embodiment

FIG. 1 is a block diagram of a mobile station access for internet protocol address allocation from an external packet data network 40. As mobile station is used herein, it includes a cellular telephone, personal digital assistant, computer laptop, pager or other "intelligent" device. Mobile station 10 is coupled to tower 15 of RAN 15 (radio access network). This coupling is in the form of an over-the-air cellular

link in the example shown in FIG. 1, the link is a cellular one. Tower 15 and RAN 20 form the basis of the cellular network with which mobile station interfaces. Although a terrestrial cellular network is shown, a satellite communication network or other IPV6 network, such as a wireless LAN, is a suitable equivalent.

RAN 20 is coupled to SGSN (Signaling GPRS Support Node) 25 of core network 31. Either an intra-operator or inter-operator backbone 30 connects SGSN 25 to GGSN 35 (Gateway GPRS Support Node). GGSN 35 interfaces with the packet data network 40 in a stateful address autoconfiguration procedure to obtain an internet protocol version 6 address for mobile station 10. The internet protocol version 6 address is then relayed from packet data network 40 to GGSN 35 to mobile station 10.

FIG. 2 is a message flow diagram of an IP address allocation method for mobile terminals. Mobile station 10 requests a packet data protocol (PDP) context activation request 51 to SGSN 25. The request is for connectivity between the mobile station 10 and an external packet data network 40. The SGSN (Serving GPRS Support Node) 25 forwards the request for connectivity 52 to GGSN (Gateway GPRS Support Node) 35. GGSN 35 examines the contents of the message. Based upon the message contents, the GGSN 35 determines that mobile station 10 needs an IPv6 address from the address space which is managed by the external packet data network 40.

The external PDN 40 requires the use of a stateful address autoconfiguration in order to obtain an IPv6 address. Acting on behalf of the mobile station 10, GGSN 35 solicits the address of a DHCP (Dynamic Host Configuration Protocol) server 41 within PDN 40 with the DHCP solicit message 53. PDN 40 responds to the

request of GGSN 35 with a DHCP advertise message 54.
The advertise message provides the address of the DHCP
server 41 to be used by GGSN 35.

Responsive to the advertise message 54 from the
5 external network, the GGSN sends a DHCP request message
55 to the DHCP server 41 of PDN 40 requesting an IPv6
address. Packet data network 40 then responds with an
IPv6 address assigned to mobile station 10. Next, GGSN
35 performs a duplicate address detection (DAD) 57
10 procedure to validate the uniqueness of the IPv6
address.

When GGSN 35 determines the address to be unique
the GGSN transmits the interface identifier portion of
the IPv6 address back to the mobile station 10 through
15 SGSN 25. GGSN 35 responds to the initial PDP context
request 52 with a PDP context response message 58 which
is transmitted to SGSN 25. SGSN then transmits a
context activation response message 59 to the mobile
station 10 via the radio access network (RAN) 20.

20 After sending the PDP context response message 58,
the GGSN 35 also transmits a router advertisement
message 60 to the SGSN 25. Router advertisement
message 60 includes the network prefix obtained from
the IPv6 address assigned to mobile station 10 by the
25 external PDN 40. The mobile network comprising RAN 20,
SGSN 25 and GGSN 35 does not manage or control this
particular prefix.

Next, SGSN 25 transmits the router advertisement
including PDN network prefix message 61 to mobile
30 station 10. When mobile station 10 receives the router
advertisement message 61 from SGSN 25, mobile station
10 performs a stateless autoconfiguration process. As
a result, mobile station 10 creates the same IPv6
address as was assigned by PDN 40. Mobile station 10
35 created this same IPv6 address without the need for
duplicate address detection, 62, since GGSN 35 has

previously determined the uniqueness of the address.
As a result, additional signaling over the air between
the SGSN and mobile station 10 is alleviated.

This allocation address procedure has the benefit
5 of requiring mobile station 10 to support only one
method of obtaining an IPv6 address, regardless of the
network which allocates the address. Mobile station 10
is not required to support an additional procedure for
stateful address autoconfiguration such as DHCP.
10 Further since the GGSN 35 performs the duplicate
address detection process, the mobile device(s) 10 do
not need to verify the uniqueness of the address and
additional over the air signaling is saved as a result.
Lastly, since the duplicate address detection
15 procedures are not performed by the mobile device,
there is no need to broadcast neighbor solicitation
messages to other mobile stations in order to verify
the uniqueness of the IPv6 address. As a result, the
mobile device's design is much simpler and considerable
20 over the air message transmission time is saved,
thereby greatly increasing the battery life of the
mobile station.

Although the preferred embodiment of the invention
has been illustrated, and that form described in
25 detail, it will be readily apparent to those skilled in
the art that various modifications may be made therein
without departing from the spirit of the present
invention or from the scope of the appended claims.

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